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FOREST PEST MANAGEMENT

3430 BIOLOGICAL EVALUATION
R2-83-7

WESTERN TENT CATERPILLAR
PAGOSA RANGER DISTRICT
SAN JUAN NATIONAL FOREST
1983

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Forest Pest Management
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INTRODUCTION

Each year since 1977, several thousand acres of aspen on the San Juan National Forest and adjacent private land have been defoliated by the western tent caterpillar, Malacosoma californicum (Packard). The extent of the defoliation has increased each year since the beginning of the outbreak (Figure 1). The outbreak began on the area south of V-mountain on the Pagosa Ranger District, San Juan National Forest. Within the last few years the outbreak area has expanded easterly to include the Navajo River and Rio Chama Basins and northerly to include a portion of the Rio Blanco Basin.

In June 1983 an aerial survey determined that the defoliated area (Fig. 2) had increased from 55,400 acres in 1982 to 70,300 acres in 1983. Much of the increase occurred on the Rio Grande National Forest (Table 1).

An egg mass survey was conducted in the defoliated area in September 1983 to gather data for predicting the 1984 level of defoliation. At the same time, age, growth and defect data were gathered from the sample trees at each of the sampling sites.

BIOLOGY OF THE WESTERN TENT CATERPILLAR

The western tent caterpillar has one generation per year. From mid July to early August the adult female lays eggs in grey or brown masses encircling small branches of the host trees. Larvae develop in the egg and overwinter in this form. In the spring larval emergence is closely timed with bud burst. Larvae spin tents where they rest and molt between feedings. As they molt their colors and patterns emerge from dull black to black with blue and yellow markings around a dorsal white stripe. In 30 to 42 days the larvae mature, spin a loose cocoon either on the host tree or in the duff at the base of the tree and pupate. The buff colored adults emerge in 12 to 18 days.

EVALUATION METHODS

Three trees were felled at each of ten sampling sites. The sites sampled in 1983 were the same as those sampled in 1982 (Figure 1). Each limb was searched for new egg masses to determine the total number of egg masses per tree. In addition, two 30-inch branches from the upper crown of each tree were examined separately and the quantity of egg massses on each branch was tallied.

To determine age, growth and defect data from each tree, a cross section was taken from the base and at eight-foot intervals to a 4 inch top. The cross sections were taken to our laboratory. The age, mean annual increment

Figure 1-- Area of Defoliation by Western Tent Caterpillar on the Pagosa Springs Ranger District and Adjacent Lands, 1977-1983.

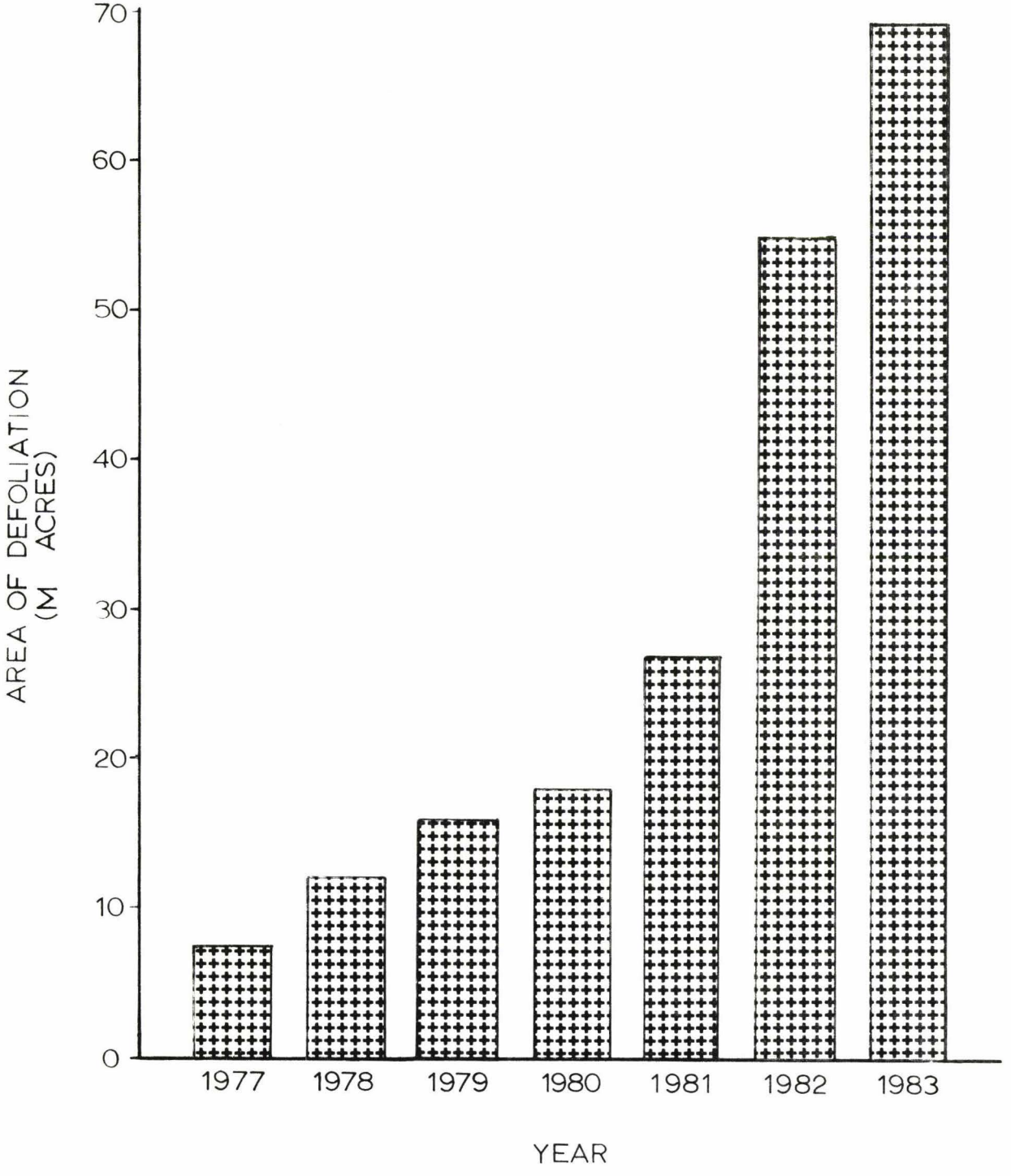

Table 1. Western Tent Caterpillar Defoliation Acreage by Ownership Class, 1982-1983 1/

	Acres of Defoliation	
	1982	1983
Rio Grande National Forest	3,500	14,000
San Juan National Forest	19,600	21,000 ¶
Other Federal	100	300
Private	32,200	35,000
Total	55,400	70,300

1/ Acreage defoliated by western tent caterpillar was determined from aerial sketch maps made at the time of peak defoliation.

¶ Approximately 6,500 acres of the defoliated area in the San Juan National Forest lie within the South San Juan Wilderness Study Area.

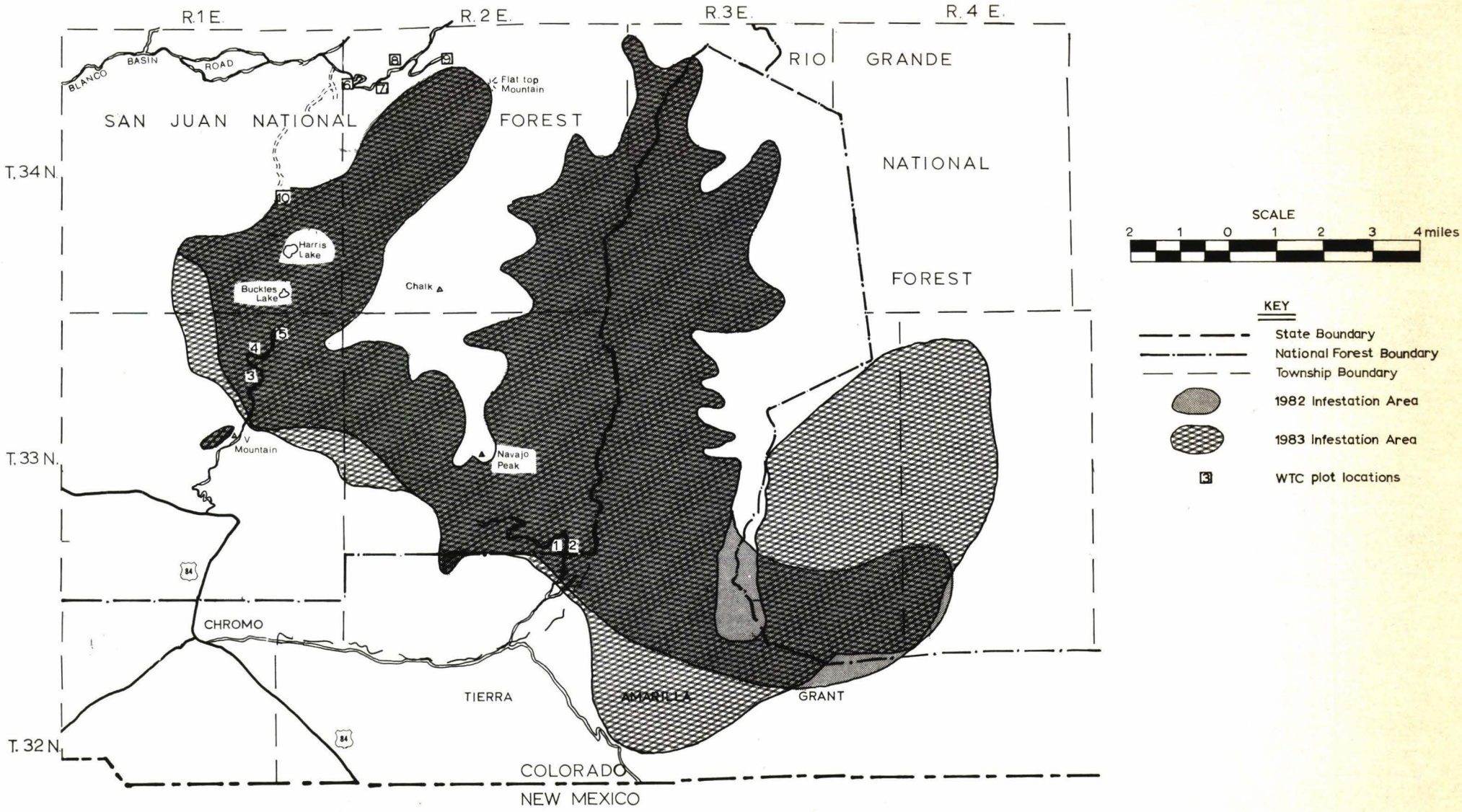

Figure 2--Western tent caterpillar defoliation on the San Juan and Rio Grande National Forests and adjacent land.

Table 2. Egg mass data from the two 30-inch branch sampling design on the Pagosa Ranger District, 1977-83.

	Year of Oviposition						
	1977	1978	1979	1980	1981	1982	1983
Number of trees sampled	34	37	88	88	84	--	30
Total number of egg masses	192	147	422	622	454	--	135
Average no. of egg masses per two branch sample	2.84	1.97	2.40	3.28	3.21	--	2.25
Standard Error	0.47	0.47	0.25	0.33	0.39	--	0.53
95% Confidence Limits	±0.96	±0.81	±0.50	±0.65	±0.77	--	±1.04†/
Defoliation	Heavy	Heavy	Heavy	Heavy	Heavy	--	Predicted¶/ Heavy

†/ The probability that the mean egg mass density lies between 3.29 and 1.21 egg masses per two branch sample is about 95%.

¶/ Heavy defoliation is predicted since the average number of egg masses per two branch sample found in 1983 falls within the range of egg mass densities that have resulted in heavy defoliation in the past.

Table 3. Results of 1983 Western Tent Caterpillar Survey Pagosa Ranger District, San Juan National Forest.

Area (sample site no.)	CLUSTER MEANS						
	Egg Masses per Tree	Egg Masses per Two Branch Sample	% x c defect	Mean Annual Increment (mm)	5-Year Mean Growth (mm)	Mean Tree Age (yrs)	Mean Tree Dia. (in.)
Price Lakes (1)	57.0	5.3	46.2	3.0	1.2	57.7	6.1
Price Lakes (2)	194.3	5.3	40.8	4.8	1.8	44.3	7.0
Road 663 (3)	13.0	0.7	63.3	3.5	0.7	60.7	10.7
Road 663 (4)	17.3	0.8	10.3	2.8	1.2	97.0	9.1
Road 663 (5)	33.3	0.8	6.4	3.7	2.3	63.7	9.3
Blanco Basin (6)	52.3	0.3	40.5	2.6	1.1	103.7	10.2
Blanco Basin (7)	120.7	2.5	21.1	3.7	1.2	76.7	9.8
Blanco Basin (8)	24.7	0.8	31.8	5.0	2.2	42.7	7.5
Blanco Basin (9)	56.7	1.8	5.2	3.1	0.9	71.0	7.9
Mtn. Bird Ranch (10)	153.0	4.0	5.1	5.0	2.3	50.3	9.4
Summary	72.2 $\pm$ 16.2	2.25 $\pm$ 0.53	27.0$\pm$4.2	3.7 $\pm$ 0.2*	1.5 $\pm$ 0.1*	66.8	8.8

* Significantly different at p = .95

(MAI) and mean growth for the last five years was determined from the basal cross-section. The defect for each cross section was calculated as a percentage of its total area. The mean defect for each tree was then determined from all the cross sections.

RESULTS AND DISCUSSION

Egg mass densities are the principal tool in predicting defoliation by the western tent caterpillar. Since 1977, defoliation predictions were based on the average number of egg masses per two branch sample.

A summary of egg mass sampling results for the years 1977 through 1982 is presented in Table 2. Egg mass densities for each of these years resulted in heavy defoliation of aspen (Linnane 1977, 1979; Raimo 1982; Averill 1982).

In 1983, the mean egg mass density was 2.25 egg masses per two branch sample indicating that heavy defoliation can be expected in 1984. The average whole tree egg mass density for all areas was 72.2 egg masses per tree in 1983 and 87.0 egg masses per tree in 1982. The mean defect was 24.3 percent in 1982 and 27.0 percent in 1983. Tree age, increment, defect and egg mass density data for each area are presented in Table 3.

An f-test of the increment data showed that aspen growth within the infested area was significantly reduced during the last five years.

ALTERNATIVE ACTIONS

In February 1983 the San Juan National Forest developed an Environmental Assessment (EA) of the western tent caterpillar situation on the Pagosa Ranger District and adjacent private lands. Nine alternatives were considered in the EA.

Alternatives considered but eliminated were as follows:

1. Chemical insecticides were eliminated because of known adverse effects and the availability of a less hazardous and equally effective biological control agent.

2. Ground application of any material was eliminated because they are not economically or physically feasible.

3. Any of the various combinations involving partial treatment of aspen outside the South San Juan Wilderness Study Area with the objective of protecting Federal lands was eliminated because the reinvasion potential would be too high to justify the investment.

4. Logging as an alternative for control was not considered because it would not remove the insect as they would remain in the slash.

Alternatives considered in detail are as follows:

1. No Action - The current infestation would be allowed to take its natural course. Monitoring the insect status would be the only management requirement and there would be no mitigation.

2. Aerial application of B.t. to all the infested F.S. stands, including infested acres within the South San Juan Wilderness Study Area.

3. Aerial application of B.t. to all the infested F.S. stands outside the Wilderness Study Area.

4. Aerial application of B.t. to all the infested F.S. stands outside the Wilderness Study Area plus a one half mile wide buffer strip inside the Wilderness Study Area where there are infested stands.

5. Aerial application of B.t. to a buffer strip of F.S. infested stands along private lands.

DISCUSSION AND RECOMMENDATIONS

Forest Pest Management believes that an additional alternative should have been considered:

Alternative: Assist Forest Pest Management in establishing a pilot project in the newly infested areas of the outbreak to determine the effectiveness of aerial applications of B.t. in reducing or preventing loss in aspen.

This alternative would allow establishment of several test blocks (possibly a few hundred acres in size) within the outbreak area. Certain blocks would be treated and others would remain untreated. Actual losses in aspen would be determined and efficacy of aerial treatment would be evaluated. Post-treatment activities would include evaluation of western tent caterpillar resurgence and reinfestation.

The smaller sizes of the spray blocks in this alternative would make the per/acre cost of treatment significantly greater than those in the other treatment alternatives.

Forest Pest Management recommends this alternative because of the current lack of field data demonstrating the efficacy of B.t. against persistent western tent caterpillar populations in southwestern aspen. This lack of data occurs in three categories.

1. Although B.t. is registered with the Environmental Protection Agency for use against western tent caterpillar, no field data is available showing it can reduce persistent WTC populations to a level that would diminish or prevent loss in aspen.

2. Nothing is known about the resurgence rate of persistent western tent caterpillar populations following an application of B.t.

3. No data is available showing that western tent caterpillar does not immediately reinvade B.t. treated areas when an infestation is only partially treated.

It should be noted that funding requests along with a prospectus for each planned or anticipated pilot project or demonstration area must be submitted to FPM-RO by December 1. For suppression projects preliminary funding requests must be submitted to FPM-RO by October 1 (FSM 3452.42).

Should the forest consider a pilot test of B.t. desirable, preliminary planning should commence soon since little aerial application of insecticides has been done in the region and resources are limited.

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